Conversion and Formula Summary

There are many conversions and formulas used in selecting oil coolers. This will be a brief summary of those most commonly used.

Conversions

A. HP = (BTU's/hr) / 2545 = (BTU's/min) / 42.4 = KW/.746, or BTU's/hr = HP x 2545; BTU's/min = HP x 42.4; KW = HP x .746

B. GPM = (L/min) / 3.78 or L/min = GPM x 3.78

C. °F = (1.8 x °C) + 32 or °C = (°F - 32) / 1.8

D. Mobil Series: Air Velocity SFPM = SCFM/Face Area in Ft^2, or SCFM = Ft^2 Face Area x Face Velocity SFPM

Methods to Determine Heat Loads

A. Hydraulic oil cooling: Assume 30% of the input horsepower will be rejected to heat. If the input horsepower is unknown, this formula may be used: BTU/HR = (System PSI) x (GPM Flow) x 1.8 x .3

B. Hydrostatic oil cooling: Assume 25% of the input horsepower will be rejected to heat.

C. Automatic transmission: Assume 30% of the engine horsepower will be rejected to heat.

D. Engine oil cooling: Assume 10% of the engine horsepower will be rejected to heat.

Heat Loads

A. BTU's/hr = (Input Horsepower) x (2545) x (.25 — .5)

B. BTU's/hr = (System GPM Capacity) x (System Pressure) x (1.8) x (.25 —.5)

C. BTU's/hr = (PSI Pressure Drop) x (GPM Oil Flow) x (1.5) x (% Time)

D. BTU's/hr = (Horsepower to Gearbox) x (2545 x (.05 — .5)

E. BTU's/hr = (Compressor HP) x (1.1) x (.85) x (2545)

F. BTU's/hr = (Max Temp. Rise °F/hr) x (Gallons of Oil Changing Temp.) x (3.5)

G. BTU's/hr = (GPM Oil Flow) x (Oil △T) x (210)

Conversions

°F = (1.8 x °C)+32

BARS = 14.5 x psi

BTU/hr = .2931 x WATTS

BTU/min = .01757 x KW

$ft^2 = in^2 / 144$

$ft^2 = 92900 \times mm^2$

GPM = 3.78 x L/mim

HP = BTU/hr ÷ 2545

HP = BTU/min ÷ 42.41

HP = 0.746 x KW

$in^2 = 645.2 \times mm^2$

$in^3 = .004329 \times GAL$

$in^3 = .01639 \times LITERS$

$m^3 = 264.2 \times GAL$

$m^3 = 1000 \times LITERS$

mm = 25.4 xin

psig = psia - 14.7

Temperature Changes

A. Oil △T = (BTU's/hr) / (GPM Oil Flow x 210)

B. Water △T = (BTU's/hr) / (GPM Water Flow x 500)

C. 50/50 Ethylene Glycol △T = (BTU's/hr) / (GPM Flow x 432)

D. Air △T = (BTU's/hr) / (SCFM Air Flow x 1.08)

Temperature Changes

Water Cooled: $\frac{\text{HP curve} = \text{HP Heat} \times 40 \times \text{Correction A}}{\text{(Oil outlet °F - Water inlet °F)}}$

AO Series: (except AOL) $\frac{\text{HP curve} = \text{HP Heat} \times 100}{\text{(Oil outlet °F - Ambient air °F)}}$

AOL Series: $\frac{\text{HP curve} = \text{HP Heat} \times 100}{\text{(Oil inlet °F - Ambient air °F)}}$

Mobile Series: $\frac{\text{BTU's/hr curve} = \text{HP Heat} \times 2545 \times 100}{\text{(Oil inlet °F - Ambient air °F)}}$

Centistokes to Saybolt Universal Seconds Conversion